

***In the Claims***

The status of claims in the case is as follows:

1     1.   [Previously presented] A method of operating a virtual  
2     private network (VPN) based on IP Sec that integrates  
3     network address translation (NAT) with IP Sec processing,  
4     comprising the steps executed at one end of a VPN connection  
5     of:

6             configuring a NAT IP address pool;

7             configuring a VPN connection to utilize said NAT IP  
8             address pool;

9             obtaining a specific IP address from said NAT IP  
10            address pool, and allocating said specific IP address  
11            for said VPN connection;

12            starting said VPN connection;

13            loading to an operating system kernel the security  
14            associations and connection filters for said VPN

15           connection;  
  
16           processing a IP datagram for said VPN connection; and  
  
17           applying VPN NAT to said IP datagram.

1       2.    [Original] The method of claim 1, wherein said VPN  
2       connection is configured for outbound processing, and said  
3       applying step comprises outbound source IP Nating.

1       3.    [Original] The method of claim 1, wherein said VPN  
2       connection is configured for some combination of inbound  
3       processing, and said applying step selectively comprises  
4       inbound source IP NATing or inbound destination IP NATing.

1       4.    [Original] The method of claim 1, further for  
2       integration of NAT with IP Sec for manually-keyed IP Sec  
3       connections, comprising the further step of manually  
4       configuring connection keys.

1       5.    [Original] The method of claim 1, further for  
2       integrating NAT with IP sec for dynamically-keyed (e.g. IKE)  
3       IP Sec connections, comprising the further step of:

4           configuring the VPN connections to obtain their keys  
5           automatically.

1       6.   [Original]   The method of claim 1, further for  
2       integrating NAT with IP Sec Security Associations,  
3       negotiated dynamically by IKE, wherein said starting step  
4       further comprises creating a message for IKE containing said  
5       IP address from said NAT pool; and further comprising the  
6       step of operating IKE to obtain dynamically negotiated keys.

1       7.   [Original]   The method of claim 6, further comprising  
2       the step of combining the dynamically obtained keys with  
3       said NAT pool IP address and wherein said loading step loads  
4       the result as security associations into said operating  
5       system kernel.

6       8.   [Currently amended]   A computer implemented method for  
7       allowing the definition and configuration of NAT directly  
8       with definition and configuration of IPsec-based VPN  
9       connections and VPN policy, comprising the steps executed by  
10      a digital processor at one end of a VPN connection of:

11           configuring the requirement for VPN NAT by a yes/no  
12           decision in a policy database for each of the three

13 types of VPN NAT, said three types being VPN NAT type a  
14 outbound source IP NAT, VPN NAT type c inbound source  
15 IP NAT, and VPN NAT type d inbound destination IP NAT;  
16 and

17 configuring a remote IP address pool or a server IP  
18 address pool selectively responsive to said yes/no  
19 decision for each said VPN NAT type.

1 9. [Currently amended] The computer implemented method of  
2 claim 8, further comprising the step of configuring a unique  
3 said remote IP address pool for each remote address to which  
4 a VPN connection will be required, whereby said remote IP  
5 address pool is keyed by a remote ID.

1 10. [Currently amended] The computer implemented method of  
2 claim 8, further comprising the step of configuring said  
3 server IP address pool once for a system being configured.

1 11. [Currently amended] A computer implemented method of  
2 providing customer tracking of VPN NAT activities as they  
3 occur in an operating system kernel, comprising the steps  
4 executed at one end of a VPN connection of:

5 responsive to VPN connection configuration, generating  
6 journal records;  
  
7 updating said journal records with new records for each  
8 datagram processed through a VPN connection; and  
  
9 enabling a customer to manage said journal records.

1 12. [Currently amended] A computer implemented method of  
2 allowing a VPN NAT address pool to be associated with a  
3 gateway, thereby allowing server load- balancing, comprising  
4 the steps executed by a digital processor at one end of a  
5 VPN connection of:

6 configuring a server NAT IP address pool for a system  
7 being configured;

8 storing specific IP addresses that are globally  
9 routable in said server NAT IP address pool;

10 configuring a VPN connection to utilize said server NAT  
11 IP address pool; and

12 managing total volume of concurrent VPN connections

13 responsive to the number of addresses in said server  
14 NAT IP address pool.

1 13. [Currently amended] A method of controlling the total  
2 number of VPN connections for a system based on availability  
3 of NAT addresses, comprising the steps executed at one end  
4 of a VPN connection of:

5 configuring the totality of remote IP address pools  
6 with a common set of IP addresses, said addresses being  
7 configured as a range, as a list of single addresses,  
8 or any combination of multiple ranges and single  
9 ~~addresses~~ addresses; and

10 limiting the successful start of concurrently active  
11 VPN connections responsive to the number of said IP  
12 addresses configured across the totality of said remote  
13 address pools.

1 14. [Previously presented] A method of performing virtual  
2 private network (VPN) network address translation on  
3 selected ICMP datagrams, comprising the steps executed at  
4 one end of a VPN connection of:

5 combining IP Security & NAT by detecting selected types  
6 of ICMP type packets; and

7 responsive to said selected types, performing network  
8 address translation functions on the entire datagram  
9 including ICMP data.

1 15. [Previously presented] A method of performing virtual  
2 private network (VPN) network address translation on  
3 selected FTP datagrams, comprising the steps executed at one  
4 end of a VPN connection of:

5 combining IP Security & NAT by detecting the occurrence  
6 of FTP PORT or PASV FTP commands; and

7 responsive to said command, performing network address  
8 translation on the FTP data and the header.

1 16. [Currently amended] A computer system for operating a  
2 virtual private network (VPN) based on IP Sec that  
3 integrates network address translation (NAT) with IP Sec  
4 processing executed by a digital processor at one end of a  
5 VPN connection, comprising:

6 means for configuring a NAT IP address pool;

7 means for configuring a VPN connection to utilize said  
8 NAT IP address pool;

9 means for obtaining a specific IP address from said NAT  
10 IP address pool, and allocating said specific IP  
11 address for said VPN connection;

12 means for starting said VPN connection;

13 means for loading to an operating system kernel the  
14 security associations and connection filters for said  
15 VPN connection;

16 means for processing a IP datagram for said VPN  
17 connection; and

18 means for applying VPN NAT to said IP datagram.

1 17. [Previously presented] A system for definition and  
2 configuration of NAT directly with definition and  
3 configuration of VPN connections and VPN policy executed by  
4 a digital processor at one end of a VPN connection,



5 comprising:

6 a policy database for configuring the requirement for  
7 VPN NAT by a yes/no decision for each of the three  
8 types of VPN NAT, said three types being VPN NAT type a  
9 outbound source IP NAT, VPN NAT type c inbound source  
10 IP NAT, and VPN NAT type d inbound destination IP NAT;  
11 and

12 a remote IP address pool or a server IP address pool  
13 selectively configured responsive to said yes/no  
14 decision for each said VPN NAT type.

1 18. [Previously presented] A system implemented at one end  
2 of a VPN connection for allowing a VPN NAT address pool to  
3 be associated with a gateway, thereby allowing server  
4 load-balancing, comprising:

5 a server NAT IP address pool configured for a given  
6 system being configured for containing multiple address  
7 configured as a range, as a list of single addresses,  
8 or any combination multiple ranges and single  
9 addresses;

10           said server NAT IP address pool storing specific IP  
11           addresses that are globally routable;

12           a VPN connection configured to utilize said server NAT  
13           IP address pool; and

14           a connection controller for managing total volume of  
15           concurrent VPN connections responsive to the number of  
16           addresses in said server NAT IP address pool.

1       19.   [Previously presented] A program storage device  
2       readable by a machine, tangibly embodying a program of  
3       instructions executable by a machine to perform method steps  
4       executed at one end of a VPN connection for operating a  
5       virtual private network (VPN) based on IP Sec that  
6       integrates network address translation (NAT) with IP Sec  
7       processing, said method steps comprising:

8           configuring a NAT IP address pool;

9           configuring a VPN connection to utilize said NAT IP  
10          address pool;

11          obtaining a specific IP address from said NAT IP

12 address pool, and allocating said specific IP address  
13 for said VPN connection;

14 starting said VPN connection;

15 loading to an operating system kernel the security  
16 associations and connection filters for said VPN  
17 connection;

18 processing a IP datagram for said VPN connection; and

19 applying VPN NAT to said IP datagram.

1 20. [Previously presented] An article of manufacture  
2 comprising:

3 a computer useable medium having computer readable  
4 program code means embodied therein for operating a  
5 virtual private network (VPN) based on IP Sec that  
6 integrates network address translation (NAT) with IP  
7 Sec processing executed at one end of a VPN connection,  
8 the computer readable program means in said article of  
9 manufacture comprising:

10 computer readable program code means for causing a  
11 computer to effect configuring a NAT IP address pool;

12 computer readable program code means for causing a  
13 computer to effect configuring a VPN connection to  
14 utilize said NAT IP address pool;

15 computer readable program code means for causing a  
16 computer to effect obtaining a specific IP address from  
17 said NAT IP address pool, and allocating said specific  
18 IP address for said VPN connection;

19 computer readable program code means for causing a  
20 computer to effect starting said VPN connection;

21 computer readable program code means for causing a  
22 computer to effect loading to an operating system  
23 kernel the security associations and connection  
24 filters for said VPN connection;

25 computer readable program code means for causing a  
26 computer to effect processing a IP datagram for said  
27 VPN connection; and

28 computer readable program code means for causing a  
29 computer to effect applying VPN NAT to said IP  
30 datagram.

1 21. [Currently amended] ~~Method~~ A computer implemented  
2 method for providing IP security in a virtual private  
3 network using network address translation (NAT), comprising  
4 the steps executed by a digital processor at one end of a  
5 VPN connection of:

6 dynamically generating NAT rules and associating them  
7 with manual or dynamically generated (IKE) Security  
8 Associations; thereafter

9 beginning IP security that uses the Security  
10 Associations; and then

11 as IP Sec is performed on outbound and inbound  
12 datagrams, selectively performing one or more of VPN  
13 NAT type a outbound source IP NAT, VPN NAT type c  
14 inbound source IP NAT, and VPN NAT type d inbound  
15 destination IP NAT.

1 22. [Original] The method of claim 1, said NAT IP address

2 pool containing multiple addresses configured as a range, as  
3 a list of single address, or any combination of multiple  
4 ranges and single addresses.